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ABSTRACT

This paper provides an overview of common sampling methods (both the good and the bad) likely to be used in community college self-evaluations and presents the results from several simulated trials. The report begins by reviewing various survey techniques, discussing the negative and positive aspects of each method. The increased accuracy and cost-effective nature of probability, as opposed to nonprobability, sampling is discussed, as are the different types of probability sampling-simple random sampling, stratified random sampling, systematic sampling, and cluster sampling. The types of nonprobability samples, including quota sampling and convenience sampling, are also described. The paper then reviews the methods and subsequent results of the simulation sampling. It concludes that, though not the same as collecting fresh data, simulations offer valuable guidance and insight to selecting sample populations. Researchers also found that random sampling is preferable to in-class surveys, and questionnaires should come as close to probability samples as possible. Appendices include data tables. (YKH)

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Survey Sampling of Community College Students: For Better or For Worse

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Abstract

California's public community colleges are being held responsible for institutional self-evaluation. Such evaluations may be in preparation for accreditation, instructional and service program reviews, or simply to gather information about what students think about the various aspects of campus life. The most common method of gathering such data is the survey, that is, a questionnaire which usually contains several items that elicit some form of student response from an array of several choices that may include scaled dimensions of agreement, favorableness, or frequency of occurrence. Sometimes such surveys are conducted via telephone or mail while others are administered to students during class time. Researchers are often reluctant to use the mail because of disappointing return rates. The telephone would be a logical choice, but students are often difficult to reach by phone given their varied hours of school, work, and social activities and the survey instrument may be too long for telephone use. Hence, the practice of giving a survey in the classroom has endured in spite of frequent objections by some faculty over having to give up precious instructional time for the interests of administration or research. This paper does not discuss the relative merits of questionnaire construction. Rather, it addresses the practical problem of how to reach students. Giving a questionnaire to the entire population of current students is likely to be cost prohibitive. Then, how should one sample students given the likelihood that many faculty are not eager to relinquish class time, and selecting only certain classes or instructors may yield a student sample that is highly unrepresentative? This paper gives an overview of common sampling methods (both the good and the bad) likely to be found in community colleges and presents the results from several simulated trials illustrating various sampling techniques. They are simulations because no one actually contacted a student. It was done by drawing various types of samples from American River College's population of students using SPSS 8.0. Detailed demographics and student goals for the population were compared to those for each sample with error rates noted. Sampling techniques which resulted in being highly representative of the population were stratified random sampling, simple random sampling, and systematic sampling (e.g., every 49th name). The sample size in each of these was 400 out of 19,945 students. Sampling techniques which were not representative of the population and yet were based upon far larger sample sizes, were cluster sampling (e.g., class sections or instructors), convenience sampling (e.g., multiple days and times; 9:00 AM classes; or introductory psychology classes). It would seem that some form of probability sampling (stratified, simple, or systematic) is preferable to the more convenient forms of giving a survey instrument in certain classes. The classes contain "captive students" which make the researcher's life a lot easier, but the results from such a convenient sample may evolve into considerable misinformation about what the college is all about or what directions it should take. It is recommended that survey questionnaires be relatively short and administered in such a way that comes closest to a probability sample.

Survey Sampling of Community College Students: For Better or for Worse

It is commonplace to periodically collect information from college students regarding their opinions, attitudes, beliefs, and practices toward various aspects of campus life. The most common method of gathering such data is the survey, that is, a questionnaire which usually contains several items that elicit some form of student response - usually by darkening a "bubble" in an array of several choices that may include dimensions of agreement, favorableness, or frequency of occurrence. Sometimes such surveys are conducted via telephone or mail, while others are administered to students during class time. Researchers are often reluctant to use mail as a delivery mechanism because of disappointing return rates. The telephone would be a logical choice (as it is with national polling), but students are often difficult to reach by phone given their varied hours of school, work, and social activities . Furthermore, any telephone survey is best done with only short questionnaires and administrated by trained interviewers - conditions that community colleges seem to have difficulty in meeting. Hence, the practice of giving a survey in the classroom has endured in spite of the sometimes objection by faculty over having to give up precious instructional time for "the administration's interests" or "research time." Yet surveys will not disappear any time soon because there are increasing demands upon community colleges to produce evidence about what students think about certain practices - be it evaluation of faculty, courses, programs, or services. Institutional accountability measures that are required by both internal and external constituencies usually contain measures of what students think and the vehicle for collecting that data is often the survey instrument, i.e., the questionnaire.

The purpose of this paper is not to discuss the relative merits of different forms of questionnaires or response menus. Rather, with increasing demands to elicit the opinions of students, the researcher (or any person given such a responsibility) must tackle a practical problem, how to reach the students? Giving a questionnaire to the entire population of current students is likely to be highly impractical and cost prohibitive. Then, how should one sample students given the fact that faculty are not eager to relinquish class time and selecting only certain classes or instructors may yield a student sample that is highly unrepresentative?

This paper gives an overview of common sampling methods (both the good and the bad) likely to be found in community colleges and presents the results from several simulated trials illustrating various sampling techniques. These are called simulations because no one actually contacted a single student. It was all done by artful programming and using our student performance database to compare certain demographic features of the population compared with the same features of several trial samples. With each, the demographic results that were based upon a sample were compared with the actual results based upon the population with the degree of error noted. In addition to the usual demographic profile, we examined the educational goals of students - both for the population and for each trial sample. In a way, this procedure is largely an academic exercise in survey sampling, because in the "real world," one must make contact with students who may opt to either participate or not. Still, in spite of not having to actually collect fresh data, something might be learned from the amount of sampling error found in these simulations. First, we want to review the various types of samples which can be dichotomized into either probability or nonprobability samples. *Probability samples* are those in which there is some way to form an estimate of the likelihood that members of a population will be chosen for inclusion within a sample. Excellent sources of information about probability sampling may be found in the reference section of this paper. In *nonprobability sampling*, there is no way to estimate this and certainly no high degree of assurance that the chosen sample will be close to being representative of the population.

Types of Probability Samples

Simple random sampling: In this type of sampling, every member in the population has an equal and independent chance of being selected for the sample. This is much like the common method of drawing names out of a hat provided that it is done in an impartial way. The community college researcher must have computer access to the entire student population, that is, know how many students there are and how to set up a population database. To do this type of sampling, all students in the population are assigned an unduplicated number such as social security number. A table of random numbers may then be used to generate the numbers to be selected that will correspond to student identification numbers in the population. Most statistical software programs (and even some scientific calculators) provide random numbers or have a random selection feature. The result should be a student sample that is reasonably representative of the student population in terms of their characteristics.

Stratified random sampling: In simple random sampling, one hopes that the impartial way of selecting the sample will also result in a representative sample. To add insurance toward being representative, a researcher may use stratified random selection. First, population subgroups are identified that are based upon a particular characteristic or strata, e.g., male-female; ages <18 -20, 21-29, 30+years. Each of these subgroups are considered as a separate population and random selection is made within each of these. For example, assume that a student population at a community college is 40% male, and of these, 10% are <18-20 years of age, 25% are 21-29, and 5% are 30+ years of age which sums to the 40%. Also assume that the total sample size is to be 400. The researcher now must identify all members of this population subgroup who are male and from <18 to 20 years of age. Next, the researcher randomly selects 10% or 40 individuals who meet this criterion (.10 x 400). Continuing, 25% or 100 individuals (.25 x 400) are randomly selected from the next population subgroup. Finally, 5% or 20 students (.05 x 400) are randomly selected from that particular population subgroup. Thus the sample reflects not only the proportion of males, but the same age proportions as well. In this way, the chosen sample will be representative of the population. The major drawback to this approach is that the researcher must know all the characteristics or strata of the population in advance of random selecting. Often this is not the case and, if not, simple random sampling is a desirable substitute.

Systematic sampling: This is the label for the type of sample where every n^{th} member of the population is chosen until the desired sample size is reached. For example, assume that the student population is 20,000 and listed in alpha order. Also assumed the desired sample size is 400. Then dividing 20,000 by 400 equals 50. By randomly starting near the top of the list, every 50th name is selected. The "50" is also called the skip number. One may adjust the skip number to reach an exact sample size or slightly over the minimum desired size. While the systematic sampling method is generally acceptable, it technically does not fit the definition of a strict random sample because not everyone in the population has an equal chance of being selected nor is there complete independence. For example, more students with the last name of Smith will be chosen than Taylor because there are more Smiths in the population. Furthermore, selecting the relatively rare name of Richardsen may influence selection of the next person with the name of Richardson because it was skipped over.

Cluster sampling: In cluster sampling, clusters or units of individuals are randomly selected for the sample rather than individuals themselves. The unit making up a cluster may be certain instructors, course sections, or even colleges within a population of colleges. Once all clusters are identified in the population, a certain number of them are randomly selected from the population of all such clusters. Then all individuals within the selected clusters become part of the final sample. As an example, a researcher may identify the names of all faculty at a particular community college. She may then randomly select 10% of the faculty and use all of their students for the sample. The researcher must also eliminate

duplicate student names (e.g., when one student is enrolled with more than one instructor chosen as a cluster). Suppose a researcher wanted to sample community college students in California. In this case, a cluster could be individual colleges. Within the chosen colleges, the researcher may randomly pick departments, or even courses in order to reach the students. Such procedures would be called multi-stage cluster sampling.

Types of Nonprobability Samples

Quota sampling: A quota sample is similar to a stratified random sample with one major difference; within each strata, members are selected in a manner that may not be random or representative of the population. What matters is to get the necessary proportion (or percent) in the sample that fits the research needs. For example, assume one wanted a sample that was proportional to the population and that males represented 50% of that population of 10,000 students. Then a sample of 400 students must contain 200 males which would also be 50%. It may not be so important how the 200 males were selected although it would be difficult to justify using the first 200 males sitting in the college cafeteria. Obviously, that would not be a desired sampling technique. However, there are also times when a researcher might want to contrast the responses of certain groups. For example, one could randomly select 300 whites, 300 Asians, 300 African Americans, 300 Hispanics, 300 Native Americans, and another 300 students representing all other ethnic categories. Obviously, this would not be a representative sample either, but it would enable the researcher to compare equal sized groups which may suit the research purpose.

Convenience sampling: Any sample that is based upon factors in which convenience plays a major role is, by definition, a convenience sample. For example, selecting only students in one particular class or students in course sections that meet only on particular days and hours constitute convenience samples. Using only people who actively volunteer for a study may also be considered a convenience sample. Such samples may be relatively easy to procure but are not likely to be highly representative of the population.

Other types of nonprobability sampling: Sometimes a researcher will want to target a specific group for a survey. An example would be students using the computer laboratory. Such a specific sample is sometimes referred to as a purposive sample. A special case of purposive sampling, called snowballing, refers to a procedure where a respondent is asked not only to take the survey but deliver it to other people who fit the research needs. For example, one of us (Rasor) once asked students in a class to give a survey to any divorced male they knew including themselves, if appropriate. In a similar manner, students may be asked to enlarge a sample size by asking friends to participate. Admittedly, the results from such a "shot gun" survey delivery system cannot be assumed to be representative of a particular population. The researcher is obliged to stick with describing the sample and not generalizing to a greater mass.

How Large a Sample for a College Survey?

The glib answer is "the more the merrier." But this needs to be qualified. It is true that if the sampling is done well, the larger the sample size, the more reliable the results should be. However, there is a point at which sufficient accuracy is attained and a further increase in sample size adds little to the accuracy but adds substantially to administrative costs. Probability sampling that is done well is cost efficient in that the researcher does not need an enormous sample size. Even a national survey of the general public requires about 1,500 individuals to be within acceptable error limits.

In Table 1 are the minimum sample sizes relative to the sizes of a population that are necessary to achieve a specified degree of error tolerance. For example, if the population enrollment at a college is

20,000 one would need to randomly sample at least 377 students. This count would enable the researcher to claim that the results should have no greater than a 5% margin of error and be 95% confident about that claim. If one wanted no greater than a 3% margin of error with 95% confidence, the necessary minimum sample size would have to be at least 1,033. Note that there is no way of determining the necessary sample size for assuring accuracy when using nonprobability sampling. Even a convenience sample that is 50% of the population size may dramatically exceed the acceptable margin of error. Finally, the sample sizes in Table 1 indicate ending valid counts - not how many questionnaires to duplicate or how many phone calls to make.

Table 1. Selecting the Size of a Random Sample (For Use With a Survey.

The values listed below indicate the necessary randomly drawn sample size, with a given margin of error, relative to the size of the population. The results derived from the sample should be within ± 5%, ± 3%, or± 1% of the population percentage with 95% degree of confidence.

Popultion Size	5 % Error Sample Size	3 % Error Sample Size	1 % Error Sample Size
50	44	48	50
100	79	92	99
200	132	169	196
500	217	343	476
1,000	278	521	907
2,000	322	705	1,661
5,000	357	894	3,311
10,000	370	982	4,950
20,000	377	1,033	6,578
100,000	383	1,077	8,926
1,000,000	384	1,088	9,706
100,000,000	384	1,089	9,800

Source: Mitchell, M. & Jolley, J. (1988). Research Design Explained. New York: Holt, Rinehart and Winston, Inc.

Methods

Participants. All students who were officially enrolled during the fall 1997 semester constituted the population. There were a total of 19,945 students. To simplify the extended classification of demographic variables, the following categories were established:

Gender:	male or female;
Age:	<18-20; 21-29; 30+
Ethnicity:	White; African American; Asian + Filipino + Pacific Islander; Hispanic + American Indian (Native American); Other.
Educational goal	Transfer; AA/AS degree only; Certificate; Other.

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In Table 2 is the complete listing of population demographic frequencies and percentages along with the stated educational goals for this particular population at American River College. Note that 52.2% of the fall 1997 student population indicated a goal of transfer.

Table 2. Demography and Goals for Population of Students in Fall 1997 (N=19,945).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	1394	6.99%	1852	9.29%
			Afr. Amer.	163	.82%	195	.98%
			Asian, Fil., PI.	334	1.67%	286	1.43%
			Hispanic, Amer. Ind.	261	1.31%	348	1.74%
			Other	87	.44%	114	.57%
	21-29	Ethnicity	White	1981	9.93%	2295	11.51%
			Afr. Amer.	206	1.03%	314	1.57%
			Asian, Fil., PI.	413	2.07%	381	1.91%
			Hispanic, Amer. Ind.	433	2.17%	426	2.14%
			Other	131	.66%	149	.75%
	30+	Ethnicity	White	2088	10.47%	3556	17.83%
			Afr. Amer.	256	1.28%	428	2.15%
			Asian, Fil., PI.	302	1.51%	391	1.96%
			Hispanic, Amer. Ind.	340	1.70%	484	2.43%
			Other	136	.68%	201	1.01%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	10413	52.2	52.2	52.2
	AA Degree	1849	9.3	9.3	61.5
	Certificate	1122	5.6	5.6	67.1
	All Others	6561	32.9	32.9	100.0
	Total	19945	100.0	100.0	

Procedures. SPSS 8.0 is our statistical computer package. With each type of probability sample, we tried to select a sample size that would be realistically used (e.g., n = 400) and followed strict guidelines as called for by the nature of the sample. We also conceptualized the dependent variable or main outcome statistic to be the educational goal. Table 2 shown above represents a 2 x 3 x 5 cell division (gender x age x ethnicity), or 30 categories. To draw a stratified random sample of size 400 required setting up 30 subpopulations and randomly drawing within each subpopulation the proportional number. As an example, consider white males who fall into the age range of <18 to 20. There were 1,394 such individuals in the population which is a proportion of .0699. To properly reflect the population strata, the sample proportion must be the same. Then multiplying .0699 times 400 = 28 individuals who are randomly selected from the subpopulation of 1,394. This procedure is continued through all strata, i.e., for all 30 categories. The percentages within the goal categories of the sample were then compared to those of the population.

With simple random sampling and with our restrictions on the total sample size, we let the computer select the final sample because there is such a program within SPSS. We then examined the percentage differences between the population and the random sample demographic variables as well as the educational goals. With systematic sampling, we selected every 49th name from an alphabetized list which yielded a sample size of 400. We experimented a bit with a random cluster sample of class sections in order to reach close to 400 individuals. From that point on, we were guided by selecting various nonprobability samples which we have seen before and can best be described as convenience samples, e.g., all sections of introductory psychology. After each sampling, we did as before - examined the percentage differences between the population and the sample demographic variables as well as the educational goals. Standard deviations were computed based upon the distribution of differences between percentages. These can be interpreted as an overall index of sampling error. Furthermore, we computed chi square values in application of good fit between the sample cell frequencies and those frequencies expected by the population proportions. What follows are examples.

A sample standard deviation is based upon the distribution of differences between sample percents and population percents.

Example: Sample size = 386

Student Goal:	Sample%	Population%	Difference%
Transfer	58.8	52.2	6.6
AA degree	13.5	9.3	4.2
Certificate	3.4	5.6	-2.2
All others	24.3	32.9	-8.6

Standard deviation = 5.9

The chi square test of good fit compares the obtained frequencies in all cells of the sample with those expected which are proportional to the population.

Example: Sample size = 386

Student Goal	Population (p)	Expected (fe)	Obtained (fo)	$\frac{(fo-fe)^2}{fe}$
Transfer	.522	201.49	227	3.23
AA degree	.093	35.90	52	7.22
Certificate	.056	21.62	13	3.44
All others	.329	126.99	94	8.57
	1.000	386.00	386	22.46

Chi square tabled .05 value for 3 degrees of freedom = 7.815

Results: Chi square (df = 3, n = 386) = 22.46, $p < .001$. Because the obtained chi square exceeds the tabled value of 7.815, the results are statistically significant. There is not good fit between the sample frequencies and those expected from the proportions in the population. In other words, the sample is biased to a degree that is likely to be unacceptable.

Results of Simulation Sampling

Rather than display the complete outcomes of every sample as we did with the population (Table 2), only summarized results are presented in Table 3.

Table 3. Summary Statistics Including Chi Square Test of Good Fit for Various Types of Samples.

Sample Type	Student Sample Size	Demographics			Student Goal			Good Fit?
		Error Range %	SD	Chi Square	Error Range %	SD	Chi Square	
Convenience: 9:00 AM, MWF	2,077	-10.8 to 13.4	3.96	1,317.70 (p<.001)	-17.7 to 24.5	15.31	516.05 (p<.001)	NO
Convenience: Psych 1	737	-10.5 to 19.9	4.66	636.51 (p<.001)	-14.5 to 22.2	13.51	146.05 (p<.001)	NO
Convenience: Multiple Days & Times	2,799	-6.8 to 10.3	2.82	945.52 (p<.001)	-13.5 to 17.9	11.33	376.25 (p<.001)	NO
Cluster: Instructors	10,364	-3.8 to 3.7	1.22	622.49 (p<.001)	-7.1 to 10.4	6.41	467.17 (p<.001)	NO
Cluster: Sections	386	-5.5 to 3.1	1.46	56.76 (p<.001)	-8.6 to 6.6	5.90	22.46 (p<.001)	NO
Simple Random #1	400	-2.5 to 1.9	0.89	26.33 (ns)	-3.7 to 3.6	2.58	2.64 (ns)	YES
Simple Random #2	400	-4.0 to 1.6	1.00	31.66 (ns)	-3.2 to 2.3	2.04	2.60 (ns)	YES
Simple Random #3	400	-2.5 to 1.2	0.79	21.21 (ns)	-2.6 to 1.4	1.55	1.22 (ns)	YES
Systematic: Every 49th	400	-1.3 to 1.3	0.57	15.52 (ns)	-1.9 to 2.5	1.59	3.25 (ns)	YES
Stratified Random	400	-0.2 to 0.1	0.07	0.40 (ns)	-0.7 to 0.4	0.41	0.09 (ns)	YES

The first (and the worst) was a convenience sample consisting of the total student enrollment in all 9:00 AM - MWF classes. The resulting sample size is 2,077. The demographic error range is expressed as two percents, in this case, -10.8% to 13.4%. This indicates that among the 30 possible demographic cells described previously, the two extreme differences between the sample and the population were those two values. In one cell, the sample percent was below the population percent by 10.8 points (the difference). The highest positive difference where the sample percent exceeded the population percent was 13.4. The standard deviation of the 30 differences between percents was 3.96. The chi square of good fit for the demographic frequencies was 1,317.70 which is highly significant. As for the four

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categories of educational goals, the error range was -17.7% (the sample percent was lower by this amount than the population) to 24.5% (the sample percent was higher by this amount than the population). The standard deviation of the distribution of percent differences is 15.31 while the chi square test of good fit yielded a value of 516.05 which is highly significant. This clearly indicates that the 9:00 AM - MWF convenience sample was not a good representation of the population in terms of demography or educational goal. Even while these 2,077 students are slightly over 10% of the size of the population, there is not good fit between the obtained frequencies in the various cells and those expected using the population as a model.

The next sample consisted of all students enrolled in transfer level introductory psychology sections - also a convenience sample but one often read about in psychology journals! Here the sample size is 737. Both chi square values indicated that there is not good fit between the obtained frequencies in the various cells and those expected using the population as a model.

The third sample in Table 3 is one similar to those used for such things as campus climate or accreditation surveys. We extracted an unduplicated student count for those enrolled in any of the following sections: 9:00 AM (MWF); 9:30 AM (TuTh); 1:00 PM (MWF); 1:30 (TuTh); and 7:00 PM (W). This convenience sample yielded 2,799 students which represented 14% of the size of the population. Once again, the sample is quite biased in that the chi square values are highly significant.

The fourth sample was somewhat of an experiment on cluster sampling. We randomly selected 25% of our full-time faculty and 25% of our adjunct faculty. Then the students in all their classes were selected for inclusion within the sample. Of course, we also ran an unduplicated headcount. To our surprise, we ended up with 10,364 students - 52% of the population size! While it is doubtful that anyone would want such a large sample because of the probable costs involved, we decided to run the analysis anyway. Both chi squares were statistically significant, indicating that the sample does not reflect the characteristics of the population. There is an important point to be made here. Even a 52% size sample may not be representative if the units to be in the sample are not directly selected in a random way.

The fifth sample in Table 3 is a randomly drawn cluster sample of course sections. We tried to keep the sample close to our recommended 400 and did with 386 students. While this sample has decidedly lower chi square values than the previous samples, they are still statistically significant, meaning that this sample was not representative.

Next are the results of three simple random samples of size 400 each. Notice that the errors are relatively small and that none of the chi square values are statistically significant. This indicates that all three random samples are acceptable within a tolerated range of error.

Next to the last is a systematic sample using a skip number of 49, that is, every 49th name from the population alpha list was selected to yield a sample size of 400. We had not expected this sample to be quite so representative, but it was. In fact, we ran another systematic sample and that was also representative. Neither chi square values are statistically significant.

The last sample in Table 3 is stratified random. The procedure was outlined earlier in this paper. The sampling was based only upon demographic strata so we did not expect any meaningful differences between the sample and population with respect to these variables. However, we allowed the outcome of educational goal to vary, yet it fell right in with the values of the population. In other words, that chi square is almost zero indicating excellent fit between the obtained frequencies in the various cells of the sample and those expected using the population as a model.

Data in Table 4 reflect some of the error inherent in the various sampling strategies. Here we examine only the percent of students indicating transfer as their educational goal. In the population, this value is 52.2%. With a stratified sample of size 400, that value was 51.5%, an error difference of only 0.7%. With other sampling techniques, the differences are larger although some may still be acceptable.

Table 4. Percent of Students Indicating a Goal of Transfer to a University

Population	N	%	Error
Fall 1997	19,945	52.2	

Sample Type	N	%	Error
Stratified Random	400	51.5	-0.7
Systematic	400	49.8	-2.4
Simple Random #3	400	54.8	+2.6
Simple Random #2	400	54.5	+2.3
Simple Random #1	400	48.5	-3.7
Cluster (Sections)	386	58.8	+6.6
Cluster (Instructors)	10,364	62.6	+10.4
Convenience: Multiple Days/Times	2,799	70.1	+17.9
Convenience: Psych 1	737	74.4	+22.2
Convenience: 9:00 AM MWF	2,077	76.7	+24.5

Detailed outcomes from each sampling technique are found in Tables 5 through 14 in the Appendix.

Conclusions

We have indicated that running simulated samples is not the same as collecting fresh data. It is more like rolling dice in gambling but not having to place a real bet. Yet we hope that these simulations offer some guidance in how to go about selecting a sample if population representation is desired. It is obvious to us that some form of random sampling (stratified, simple, or systematic) is preferable to the more convenient forms of giving a survey instrument in certain classes. The classes contain "captive students" which make the researcher's life a lot easier, but the results from such a convenient sample may evolve into considerable misinformation about what the college is all about or what directions it should take. Finally, we recommend that survey questionnaires be relatively short and administered in such a way that comes closest to a probability sample.

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Appendix

Table 5. Demography and Goals of Students Based Upon Convenience Sample (All 9:00 AM, MWF, N=2007).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	335	16.13%	471	22.68%
			Afr. Amer.	42	2.02%	35	1.69%
			Asian, Fil., PI.	62	2.99%	72	3.47%
			Hispanic, Amer. Ind.	62	2.99%	81	3.90%
			Other	26	1.25%	27	1.30%
	21-29	Ethnicity	White	178	8.57%	179	8.62%
			Afr. Amer.	19	.91%	27	1.30%
			Asian, Fil., PI.	43	2.07%	31	1.49%
			Hispanic, Amer. Ind.	33	1.59%	27	1.30%
			Other	13	.63%	7	.34%
	30+	Ethnicity	White	65	3.13%	146	7.03%
			Afr. Amer.	11	.53%	22	1.06%
			Asian, Fil., PI.	11	.53%	14	.67%
			Hispanic, Amer. Ind.	7	.34%	22	1.06%
			Other	4	.19%	5	.24%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	1593	76.7	76.7	76.7
	AA Degree	138	6.6	6.6	83.3
	Certificate	30	1.4	1.4	84.8
	All Others	316	15.2	15.2	100.0
	Total	2077	100.0	100.0	

Table 6. Demography and Goals of Students Based Upon Convenience Sample (All Introductory Psychology, N=737).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	94	12.75%	215	29.17%
			Afr. Amer.	7	.95%	11	1.49%
			Asian, Fil., PI.	26	3.53%	30	4.07%
			Hispanic, Amer. Ind.	24	3.26%	35	4.75%
			Other	7	.95%	11	1.49%
	21-29	Ethnicity	White	56	7.60%	65	8.82%
			Afr. Amer.	3	.41%	8	1.09%
			Asian, Fil., PI.	9	1.22%	7	.95%
			Hispanic, Amer. Ind.	6	.81%	12	1.63%
			Other	2	.27%	4	.54%
	30+	Ethnicity	White	19	2.58%	54	7.33%
			Afr. Amer.	3	.41%	5	.68%
			Asian, Fil., PI.	4	.54%	4	.54%
			Hispanic, Amer. Ind.	5	.68%	8	1.09%
			Other	3	.41%		

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	548	74.4	74.4	74.4
	AA Degree	37	5.0	5.0	79.4
	Certificate	16	2.2	2.2	81.5
	All Others	136	18.5	18.5	100.0
	Total	737	100.0	100.0	

Table 7. Demography and Goals of Students Based Upon Convenience Sample (Multiple Days/Times, N=2,799).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	347	12.40%	547	19.54%
			Afr. Amer.	38	1.36%	50	1.79%
			Asian, Fil., PI.	87	3.11%	89	3.18%
			Hispanic, Amer. Ind.	65	2.32%	102	3.64%
			Other	24	.86%	28	1.00%
	21-29	Ethnicity	White	236	8.43%	297	10.61%
			Afr. Amer.	25	.89%	33	1.18%
			Asian, Fil., PI.	57	2.04%	47	1.68%
			Hispanic, Amer. Ind.	51	1.82%	39	1.39%
			Other	14	.50%	16	.57%
	30+	Ethnicity	White	121	4.32%	309	11.04%
			Afr. Amer.	18	.64%	27	.96%
			Asian, Fil., PI.	24	.86%	27	.96%
			Hispanic, Amer. Ind.	19	.68%	40	1.43%
			Other	9	.32%	13	.46%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	1961	70.1	70.1	70.1
	AA Degree	222	7.9	7.9	78.0
	Certificate	74	2.6	2.6	80.6
	All Others	542	19.4	19.4	100.0
	Total	2799	100.0	100.0	

Table 8. Demography and Goals of Students Based Upon Cluster Sample of Instructors (N=10,364).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	999	9.64%	1342	12.95%
			Afr. Amer.	124	1.20%	146	1.41%
			Asian, Fil., PI.	246	2.37%	216	2.08%
			Hispanic, Amer. Ind.	188	1.81%	243	2.34%
			Other	64	.62%	76	.73%
	21-29	Ethnicity	White	993	9.58%	1130	10.90%
			Afr. Amer.	110	1.06%	159	1.53%
			Asian, Fil., PI.	226	2.18%	202	1.95%
			Hispanic, Amer. Ind.	216	2.08%	228	2.20%
			Other	59	.57%	62	.60%
	30+	Ethnicity	White	820	7.91%	1454	14.03%
			Afr. Amer.	90	.87%	200	1.93%
			Asian, Fil., PI.	130	1.25%	172	1.66%
			Hispanic, Amer. Ind.	130	1.25%	209	2.02%
			Other	56	.54%	74	.71%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	6487	62.6	62.6	62.6
	AA Degree	831	8.0	8.0	70.6
	Certificate	369	3.6	3.6	74.2
	All Others	2677	25.8	25.8	100.0
	Total	10364	100.0	100.0	

Table 9. Demography and Goals of Students Based Upon Cluster Sample of Sections (N=386).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	39	10.10%	46	11.92%
			Afr. Amer.	3	.78%	5	1.30%
			Asian, Fil., PI.	13	3.37%	10	2.59%
			Hispanic, Amer. Ind.	9	2.33%	10	2.59%
			Other	1	.26%	3	.78%
	21-29	Ethnicity	White	17	4.40%	42	10.88%
			Afr. Amer.			5	1.30%
			Asian, Fil., PI.	7	1.81%	9	2.33%
			Hispanic, Amer. Ind.	10	2.59%	13	3.37%
			Other	3	.78%	3	.78%
	30+	Ethnicity	White	36	9.33%	68	17.62%
			Afr. Amer.	2	.52%	11	2.85%
			Asian, Fil., PI.	3	.78%	4	1.04%
			Hispanic, Amer. Ind.	3	.78%	3	.78%
			Other	3	.78%	5	1.30%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	227	58.8	58.8	58.8
	AA Degree	52	13.5	13.5	72.3
	Certificate	13	3.4	3.4	75.6
	All Others	94	24.4	24.4	100.0
	Total	386	100.0	100.0	

Table 10. Demography and Goals of Students Based Upon First Simple Random Sample of Students (N=400).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	31	7.75%	34	8.50%
			Afr. Amer.	3	.75%	4	1.00%
			Asian, Fil., PI.	5	1.25%	3	.75%
			Hispanic, Amer. Ind.	7	1.75%	6	1.50%
			Other	1	.25%	1	.25%
	21-29	Ethnicity	White	34	8.50%	41	10.25%
			Afr. Amer.	4	1.00%	8	2.00%
			Asian, Fil., PI.	9	2.25%	6	1.50%
			Hispanic, Amer. Ind.	5	1.25%	13	3.25%
			Other	2	.50%	3	.75%
	30+	Ethnicity	White	32	8.00%	79	19.75%
			Afr. Amer.	3	.75%	10	2.50%
			Asian, Fil., PI.	10	2.50%	14	3.50%
			Hispanic, Amer. Ind.	8	2.00%	14	3.50%
			Other	5	1.25%	5	1.25%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	194	48.5	48.5	48.5
	AA Degree	37	9.3	9.3	57.8
	Certificate	23	5.8	5.8	63.5
	All Others	146	36.5	36.5	100.0
	Total	400	100.0	100.0	

Table 11. Demography and Goals of Students Based Upon Second Simple Random Sample of Students (N=400).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	28	7.00%	42	10.50%
			Afr. Amer.	1	.25%	8	2.00%
			Asian, Fil., PI.	4	1.00%	6	1.50%
			Hispanic, Amer. Ind.	5	1.25%	10	2.50%
			Other	1	.25%	2	.50%
	21-29	Ethnicity	White	46	11.50%	30	7.50%
			Afr. Amer.	5	1.25%	6	1.50%
			Asian, Fil., PI.	9	2.25%	11	2.75%
			Hispanic, Amer. Ind.	12	3.00%	5	1.25%
			Other	5	1.25%	5	1.25%
	30+	Ethnicity	White	40	10.00%	77	19.25%
			Afr. Amer.	3	.75%	10	2.50%
			Asian, Fil., PI.	4	1.00%	6	1.50%
			Hispanic, Amer. Ind.	5	1.25%	5	1.25%
			Other	2	.50%	7	1.75%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	218	54.5	54.5	54.5
	AA Degree	36	9.0	9.0	63.5
	Certificate	27	6.8	6.8	70.3
	All Others	119	29.8	29.8	100.0
	Total	400	100.0	100.0	

Table 12. Demography and Goals of Students Based Upon Third Simple Random Sample of Students (N=400).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	38	9.50%	39	9.75%
			Afr. Amer.	4	1.00%	3	.75%
			Asian, Fil., PI.	7	1.75%	6	1.50%
			Hispanic, Amer. Ind.	9	2.25%	6	1.50%
			Other	1	.25%	3	.75%
	21-29	Ethnicity	White	37	9.25%	42	10.50%
			Afr. Amer.	2	.50%	5	1.25%
			Asian, Fil., PI.	7	1.75%	6	1.50%
			Hispanic, Amer. Ind.	10	2.50%	7	1.75%
			Other	1	.25%	2	.50%
	30+	Ethnicity	White	46	11.50%	71	17.75%
			Afr. Amer.	4	1.00%	14	3.50%
			Asian, Fil., PI.	4	1.00%	8	2.00%
			Hispanic, Amer. Ind.	2	.50%	10	2.50%
			Other	1	.25%	5	1.25%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	219	54.8	54.8	54.8
	AA Degree	33	8.3	8.3	63.0
	Certificate	22	5.5	5.5	68.5
	All Others	126	31.5	31.5	100.0
	Total	400	100.0	100.0	

Table 13. Demography and Goals of Students Based Upon Systematic Sample of Students: Every 49th name (N=400).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	33	8.25%	33	8.25%
			Afr. Amer.	1	.25%	4	1.00%
			Asian, Fil., PI.	6	1.50%	4	1.00%
			Hispanic, Amer. Ind.	4	1.00%	7	1.75%
			Other	2	.50%	3	.75%
	21-29	Ethnicity	White	37	9.25%	47	11.75%
			Afr. Amer.	3	.75%	4	1.00%
			Asian, Fil., PI.	3	.75%	8	2.00%
			Hispanic, Amer. Ind.	13	3.25%	10	2.50%
			Other	2	.50%	2	.50%
	30+	Ethnicity	White	45	11.25%	73	18.25%
			Afr. Amer.	6	1.50%	9	2.25%
			Asian, Fil., PI.	5	1.25%	8	2.00%
			Hispanic, Amer. Ind.	5	1.25%	14	3.50%
			Other	4	1.00%	5	1.25%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	199	49.8	49.8	49.8
	AA Degree	40	10.0	10.0	59.8
	Certificate	30	7.5	7.5	67.3
	All Others	131	32.8	32.8	100.0
	Total	400	100.0	100.0	

Table 14. Demography and Goals of Students Based Upon Stratified Random Sample of Students (N=400).

				Gender			
				Male		Female	
				Count	Table %	Count	Table %
Age	<18-20	Ethnicity	White	28	7.00%	37	9.25%
			Afr. Amer.	3	.75%	4	1.00%
			Asian, Fil., PI.	7	1.75%	6	1.50%
			Hispanic, Amer. Ind.	5	1.25%	7	1.75%
			Other	2	.50%	2	.50%
	21-29	Ethnicity	White	40	10.00%	46	11.50%
			Afr. Amer.	4	1.00%	6	1.50%
			Asian, Fil., PI.	8	2.00%	8	2.00%
			Hispanic, Amer. Ind.	8	2.00%	9	2.25%
			Other	3	.75%	3	.75%
	30+	Ethnicity	White	42	10.50%	71	17.75%
			Afr. Amer.	5	1.25%	8	2.00%
			Asian, Fil., PI.	6	1.50%	8	2.00%
			Hispanic, Amer. Ind.	7	1.75%	10	2.50%
			Other	3	.75%	4	1.00%

Goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transfer	206	51.5	51.5	51.5
	AA Degree	38	9.5	9.5	61.0
	Certificate	23	5.8	5.8	66.8
	All Others	133	33.3	33.3	100.0
	Total	400	100.0	100.0	